Measurement Device for Stress Level and Vital Sign based on Sensor Fusion

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ABSTRACT - Healthcare has become one of the principal issue with the rise in human population and medical expenditure. For a healthy life, it is essential to follow human body's vital signals. Continuous Monitoring of patient's vital signals cannot be provided outside hospital. As it is hard to monitor the patient's condition for 24 hours, it was proposed in this paper to observe continuously the condition of patient despite the patient being busy with his routine and to screen the health status to the doctors through Internet of Things.This paper proposes health monitoring system using non-intrusive biomedical sensors that measure five parameters like ECG, heartbeat, temperature and blood pressure. Proposed method makes use of Arduino Controller to which non-invasive biomedical sensors are connected. The output is displayed on any digital monitoring system using Arduino. The data obtained from the sensors is uploaded to the Thing Speak cloud to store and to access patient's information by their doctors or by the concerned for necessary follow-ups in real-time. IoT is a powerful domain where sensors can connect and data is viewed over the Internet.

I.INTRODUCTION

Stress Detection already takes place in various settings: at home for prevention and in hospital for continuous assessment. It has become a pressing need for patients, to provide better quality of care, and also for society, to lead to more effective and lower cost health care provision.

II.LITERATURE SURVEY

"Internet of Things (IoT) Based Ambulance Tracking System Using GPS and GSM Modules", (2) Aritra Baksi, Mayookh Bhattacharjee, Siddhanta Ghosh in the IEEE Access - volume 8, publication at Oct, 2020. This project aims to solve and at the least decrease the rate of this problem, using Internet of Things (IoT) technology. Each ambulance will be equipped with GPS and GSM modem which in case of emergency will send its GPS coordinates to the cloud server, which will then mark the shortest distance from its present location to the hospital via the place from where the emergency call has been raised. The components used for this project are GSM Module SIM900A along with Arduino UNO and Cloud computing. The data from the modules will be stored in a cloud server from where the paramedic officials can access it using a unique ID and password that will be issued to them on the integration of this system into the infrastructure. A fourth signal, to be controlled by the Arduino module, is to be implemented in the traffic lighting system. "Performance Evaluation of IoT Data Management Using MongoDB Versus MySQL Databases in Different Cloud Environments", (3) Walaa Saber, Mahmoud Eyada in the IEEE Access – date of the publication at June 8, 2020. This paper aims to provide a thorough comparative evaluation of two popular open- source DBMSs: MySQL as a Relational and MongoDB as a Non-relational DBMS. This comparison is based on evaluating the performance of inserting and retrieving a huge amount of IoT data and evaluating the performance of the two types of databases to work on resources with different speciations in cloud computing. This paper also proposes two prediction models and differentiates between them to estimate the response time in terms of the size of the database and the speciation's of the cloud instance.

III.EXISTING SYSTEM

"Stress Detector System Using IoT and Artificial Intelligence", (1) Areej Mustafa; Maitha Alahmed; AyshaAlhammadi; Bassel Soudan in the IEEE Access, year of the publication at 2020. This work presents the design and implementation of an IoT stress detection and classification system. Three sensors, a skin conductance sensor, an ECG sensor, and a simple skin temperature sensor are integrated into a wearable device for measurement of physiological features. The measurements are communicated to a cloud server

through the user's mobile phone. On the cloud, Artificial Intelligence algorithms analyse the sensor data and determine the user's current state of stress. The predicted state is fed back to the user's mobile for display and suggestion of stress-relieving activities. In case of emergency stress levels, a message is forwarded to the physician who can access the data through the cloud server's interface. The system is achieved 65% and 97.6% accuracy by SVM and decision tree binary classification based on real-time sensor data.

IV.BLOCK DIAGRAM OF EXISTING SYSTEM

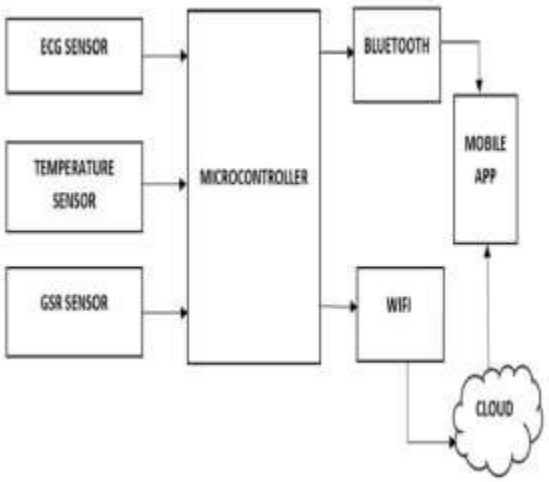

Figure 1: Block Diagram of Existing System

PROPOSED SYSTEM:

The aim of the proposed system is to design a "MEASUREMENT DEVICE FOR STRESS LEVEL AND VITAL SIGN ON SENSOR FUSION", is to
accurately detect stress with the use of Temperature sensor, HR (Heart Rate) sensor and GSR sensor, by using Random Forest machine learning algorithm and to prevent the stress related dangerous health problems by communicating through LAN and WAN .

BLOCK DIAGRAM:

V.WORKING OF THE PROPOSED SYSTEM:

The aim of this work is to design a wearable device that integrates three sensors: skin conductance sensor, temperature sensor and heart rate sensor. Skin conductance sensor for detecting the changes in skin electricity and the emotion of the person based on the sweat gland activity. Heart rate sensor detects the pulses in the blood vessels where the heart pumps blood. Skin temperature sensor is used to measure the body temperature and all the sensed data are collected as values, all the sensed data will be sent to the random forest machine learning algorithm. The main aim of the machine learning algorithm is to take most accurate data. Then the collected data will be transmitted to the Arduino, the Arduino will pass the information to the mobile app for suggesting the stress relieving activities during abnormal states through Lora for local area network and for the wide area network in case of any emergency the data will be transmitted to the mobile as normal SMS to caretaker or doctor via GSM and also stores data in webpage (MySQL).

ARDUINO MEGA CONTROLLER:

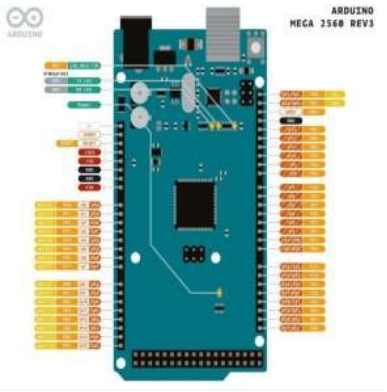

Figure: 3 Circuit Diagram of Arduino Mega Controller

TEMPERATURE SENSOR (DHT11)

The DHT11 humidity and temperature sensor makes it really easy to add humidity and temperature data to your DIY electronics projects. It's perfect for remote weather stations, home environmental control systems, and farm or garden monitoring systems. I'll first go into a little background about humidity, then I'll explain how the DHT11 measures humidity. After that, I'll show you how to connect the DHT11 to an Arduino and give you some example code so you can use the DHT11 in your own projects.

DHT11 MEASURES HUMIDITY AND
TEMPERATURE

ECG SENSOR

The ECG sensor is attached to the patient using disposable electrodes on the left and right side of the chest. The signal obtained from the body is filtered and amplified. The sensor outputs an analog signal which is then converted by the analog-to-digital converter (ADC). The serial-to-Bluetooth module transmits the digital output of the ADC to the cell phone. On the phone the sampled ECG is displayed. An electrocardiogram (ECG or EKG) is a recording of the electrical activity of the heart over time produced by an electrocardiograph, usually in a noninvasive recording via skin electrodes.

HEART RATE SENSOR MODULE

If you are wandering to make a machine which is used to detect heart rate and pulse rate. then this sensor Module is Compatible with you.

Figure: 5 Heart Rate MAX30100

Or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).Figure 7shows the Buzzer module. In game shows it is also known as a "lockout system," because when one person signals ("buzzes in"), all others are locked out from signaling. Several game shows have large buzzer buttons which are identified as "plungers".

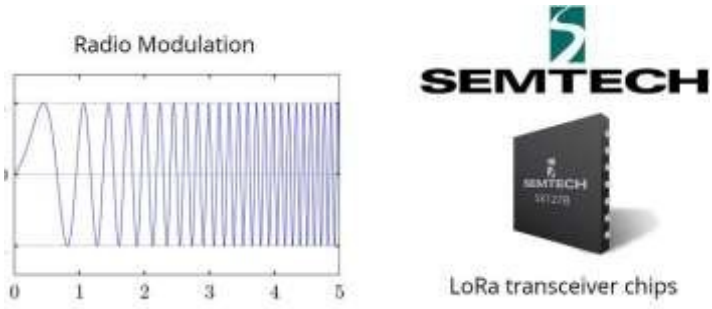

Figure: 8 Wave Form

Communication of small amounts of data (which means a low bandwidth), high immunity to interference, while minimizing power consumption. So, it allows long distance communication with low power requirements

RESULTS: IMPLEMENTATION

The sample sketch above is a blink which is also applicable for LEDs. The output is the turning on and off of the buzzer every other second. The picture below shows the setup of your module and Arduino.

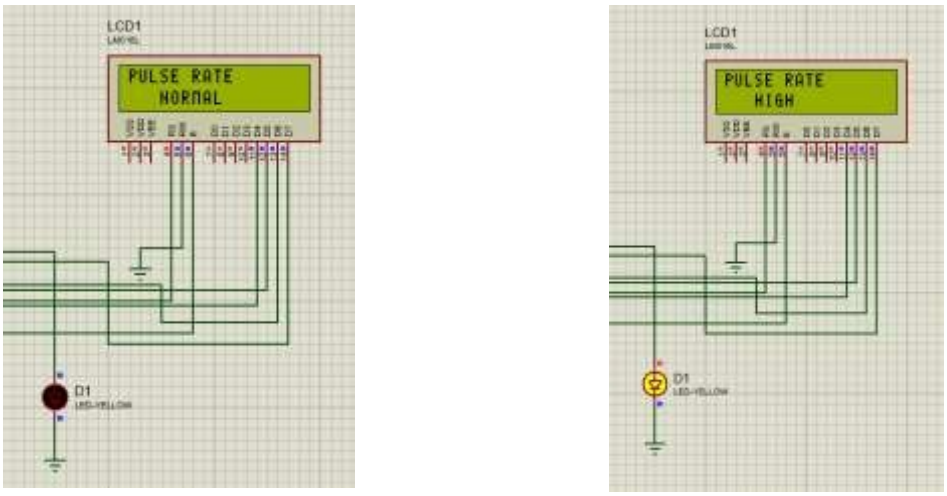

Figure: 9.1 Pulse Rate Normal

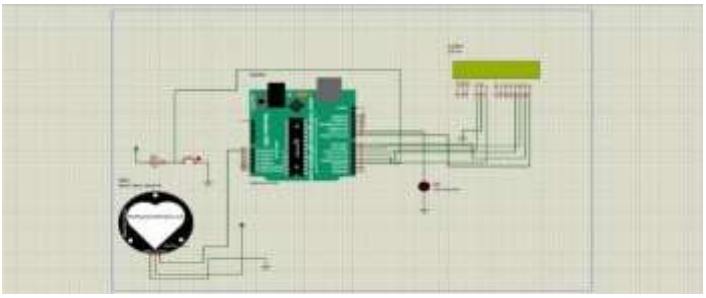

Figure: 9 simulated circuit

V.CONCLUSION:

This research involved the development of wearable and ambulatory monitoring systems. The ambulatory aspect of the device leads to a wide range of applications: In the study of vigilance when driving, where signal scan be interpreted in real-time During continuous monitoring under extreme conditions (firemen) In the study of sports performance For health monitoring at home, with a telemedicine system The future of the project is to develop an intelligent system capable of providing alarms in various situations (stress,vigilance, critical states). We are working on offline algorithms for the extraction of new relevant indicators in order to quantify autonomic nervous system activity. These indicators should have low CPU consumption in order to be embedded on an architecture device for real-time detection

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